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The Factory Report and the Foundry Industry

The most encouraging feature of the annual report* of the chief inspector of factories for the year 1944 is the material reduction in both fatal and non-fatal accidents. In 1941 no fewer than 1,646 fatal accidents were reported, as against 944 in 1938 and 1,003 last year. The non-fatal accident position is that the maximum number of injuries came about in 1942, when 313,267 were reported. In 1938, there were 179,159, and last year 281,598. The causes of these variations are quite well known and one adverse factor in next year's casualties will be the return of the ex-service men and women. Therefore, we would stress that special precautions are necessary to mitigate this impending hazard.

It is remarkable how constant are the causes of reportable accidents. Year after year, about 12 per cent. are shown to be due to falling bodies. To us, it is inconceivable that the majority are not avoidable. In our own industry, 34 people suffered fatal injuries and 14,110 non-fatal. This gives a much more favourable fatal to non-fatal accident ratio than for the whole of industry. Mr. H. R. Rogers, the deputy chief inspector, in his report on Industrial Advisory Committees, refers at length to the "First Report on Dust in Steel Foundries." His wording should be carefully studied by all foundrymen, because we have noticed throughout the years that by so doing one has a forecast of future legislation. There is disclosed a logical approach to the subject by a recapitulation of the three main dust-creating operations in foundry practice—sand preparation and mould making; mould stripping and fettling. Into the first category, there is, of course, special mention of parting powders, "which frequently contain *finely ground* silicon." The italics are ours because we feel that this may be a suitable occasion to draw attention to the draft—now available—of "The Foundries (Parting Powder) Regulations, 1946," wherein reference is made to parting sands. These, however, are not *finely ground* and, in general, resemble the natural habitat of the nomadic Arabs, who we have yet to learn suffer from silicosis. Thus, by the wording of Mr. Rogers' report, we cannot believe that it is the intention of the S.R. and O. to prohibit the use of *coarse* silica sand, such as seashore sand, for foundry use, nor is this necessary on medical grounds. Such sand is often used as a parting medium on floor-made moulds and to our mind is irreplaceable. Thus, as obviously the chief deputy inspector has *finely ground* parting powder in mind, some definition should be given of the material to be prohibited. We understand that the Institute of British Foundrymen favours a recommendation that the parting powder or sand referred to in the draft of the S.R. and O. should be limited to materials which contain more than 1 per cent. of particles which pass through a B.S. 300-mesh sieve.

Reference is also made to draft regulations in connection with shot blasting. Mixing sand with the shot is rightly to be suppressed. We are anxious that the factory inspectors should not get a "foundry dust complex" because we can assure them that scientific dust particle counts made in foundries and in city streets show concentrations in the former to be less dense.

*H.M. Stationery Office. 1s. 6d. net.

"METALS AND ALLOYS," the well-known American monthly technical journal, has changed its name to "Engineering Materials and Processing Methods," or, in short, "Materials and Methods."

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CUPOLA BED LIGHTING

By James Timbrell

Modern workshop practice demands the maximum elimination of variables. From time immemorial it has been customary to use timber for the initial lighting of cupolas. Not only has the quality of timber been a variable, but has even accounted for the loss on some occasions of valuable packing cases! For many months suitable firewood has been in short supply, apart from demolition timber, and recourse has been had to railway sleepers, the cost of which is of the order of coke. Additionally, there is the cost of assembling, splitting and drying firewood—all of which are of a variable character. To overcome these, use has been made of prepared firelighters and the paraffin pressure lamp. However, the latest notion—the use of the oxygen lance—shows many outstanding advantages.

Layout

There must be provided in close proximity to the cupola, and, if possible, near to a door where fresh cylinders can be delivered, a proper housing for the apparatus. This will consist of a hinged strap for positioning the cylinder against the wall; a suitably placed bracket for taking the coiled pipe and the lance when not in use, and a small box for housing the key.

Procedure

The special oxygen lance should be coupled to a single cylinder of oxygen and operated from a British Oxygen Company's O.R.7 scrap-type regulator, and should work at a pressure of 15 lbs. On the clean furnace bottom are placed two or three pieces of wood of 1 ft. or so in length and about 1- to 1½-in. section. These should be laid across one another towards the front, opposite the furnace door. Upon these are placed just half a dozen knobs of coal and the coke charge is added from the charging door to a depth of 20 to 24 in., according to the cupola capacity and diameter. The coke should be tipped in lightly to prevent damage to the bed bottom and, in the first instance, smaller pieces of coke should be lightly arranged around and over the wood and coal. Large pieces of coke immediately on the wood should be avoided.

A small piece of oily waste is then packed under this wood and lighted, and the oxygen stream directed upon this. The oxygen should be played steadily upon this quickly burning spot for 4 or 5 min. From this point the poker should be moved gradually across the spreading area of combustion for a further 2 or 3 min., when the fire should be found to be burning brightly. After about 10 min. of normal draft, the fire may have died down slightly and should be brightened with the oxygen stream for not more than 2 or 3 min.

Total Time

The total time for oxygen projection in the furnace should not normally exceed 10 to 12 min. During this time it will be found that some 30 to 40 cub. ft. of oxygen have been used. Generally speaking, the application of oxygen through the furnace doors is all that is required, but if the fire is not spreading towards the back of the furnace, then the oxygen jet should be played from the tapping hole to induce combustion over the whole of the bottom area.

For large furnaces or cupolas fitted with kindling tuyeres, these may be used in the normal way when combustion has reached this height, and the fire should be going satisfactorily in 20 min., as compared with 2 or 3 hrs. by the firewood method of lighting. Some foundrymen are lighting through the tuyere tube and inspection chamber instead of from the furnace bottom by arranging the wood and coal opposite the tuyere itself, but this is not universal, although it is claimed to be quicker and less costly. When this method is employed, the blast is turned on immediately the wood and coal are alight and with the oxygen jet still in operation.

In a number of cases in the North, it has been found possible to dispense with coal entirely, but until the method is established and any peculiarities appreciated in the manner of applying the oxygen jet, a small amount should be used.

An attractive feature of the scheme is the use of the lance for drying the tap hole and spout. By playing on a few red-hot cinders for two minutes good results are insured. Again, should an "iron" hole be encountered, it can be freed without resorting to the sledge hammer methods.

It is usual for the concerns supplying the oxygen to furnish the lance and cylinders on permanent loan and to make a small charge for the key and the reducing valve. In most districts there is an adequate delivery system, whilst a staff of technicians is available for consultation in case of difficulty.

ANALYSIS OF HIGH PURITY ZINC

Four scientific Papers, of investigations carried out by the British Standards Institution Panels, which was commissioned by its parent Committee to prepare recommended methods for the polarographic and spectrographic analysis of high purity zinc and zinc alloys for die casting, have been published in book form under the title of "Polarographic and Spectrographic Analysis of High Purity and Zinc Alloys for Die Casting." The recommendations of the Panel are to be published by the B.S.I. as B.S.I. 1,225—1945, but in order that an account of the experimental work leading to the recommendations should be permanently available, and the intelligent adoption of the methods and their future development be encouraged, the Ministry of Supply has sponsored the publication of this book by H.M. Stationery Office. (Price 5s., post free 5s. 4d.)

An application to Parliament authorising the promotion of a Bill to provide the proposed Tyne tunnel between Jarrow and Howdon, has been submitted by Northumberland and Durham County Councils. The project is expected to cost at least £3,000,000 and will take four years to carry out. A Government grant of 75 per cent. is expected.

THE TECHNOLOGICAL PRINCIPLES OF CASTING DESIGN

By VICTOR M. SHESTOPAL

The Author is a Professor of the Stalin Machine Tool Institute, Moscow

(*Continued from page* 322.)

Thickness of Casting Walls

The selection of the minimum permissible thickness of casting walls is based on the dimension, weight, moulding conditions, the use of the walls in the machine, etc.

Sections thinner than the following are not recommended:—

for cast iron	3 to 4 mm.
for steel	5 to 6 mm.
for bronze	3 to 4 mm.
for aluminium	4 to 5 mm.

Efforts to reduce the weight of a casting should not lead to excessively thin sections which may cause scrap, require great fluidity to cast and consequently excessively high temperatures.

The thickness and cross-section of walls should concur with the general laws for obtaining a good casting: solidify progressively and cool regularly. In tall castings the thickness of the walls should, as a rule, increase from top to bottom as they stand in the mould.

The difference in the relative thickness of the walls of castings, especially those to be joined, should be at a minimum and should not exceed the ratio 1:2.0. In cases where a great difference in cross-section is unavoidable it is recommended that the heavy section be designed with detachable parts; for instance, slideways of machine-tool beds can be bolted.

The thickness of the inner walls, in view of adverse cooling conditions, should be approximately 0.8 of the outer walls (Fig. 13).

The permissible percentage deviation in thickness of casting walls is the following:—

For jobs with a size up to 0.5 metre	+6	−2
For jobs with a size up to 2.0 metres	+8	−3
For jobs with a size over 2.0 metres	+10	−3

In places where chaplets are inserted, thin walls should have local thickening so that the mass of the metal is sufficient to melt the chaplet down. If this be not done, there is a danger of local defects being caused.

In designing it must be remembered that one and the same cast iron melted at the same temperature acquires different structures when cooled at different rates, so that different parts of the same casting may have different mechanical properties.

Test-bars cut from different parts of a cast gas cylinder showed the following differences in strength:

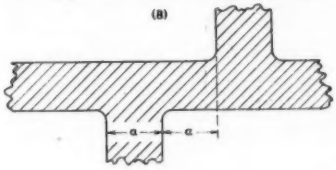
Sections in mm.	8	12	18	22
Traverse strength in kg./mm.²	37	34	32	29

The working drawings of the casting should show the minimum permissible strength at the most important sections, so that they are known to the foundrymen.

Angles, Tapering Sections, Junctions

The chief condition for obtaining castings without defects or stresses is the gradual tapering of sections and the avoidance of sharp angles. Sharp changes in the sections of walls from one thickness to another are not permissible.

The correctness of the proportions of adjacent cross-sections may be checked by the method of inscribed circles. When the change in thickness is less than



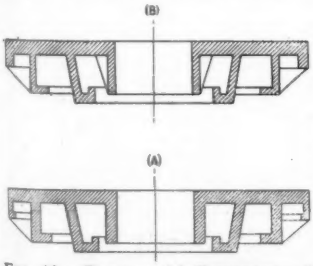


FIG. 13.—PLATE. (*a*) INCORRECT; (*b*) CORRECT. (NOTE: INSIDE WALLS SHOULD BE MADE THINNER THAN OUTSIDE.)

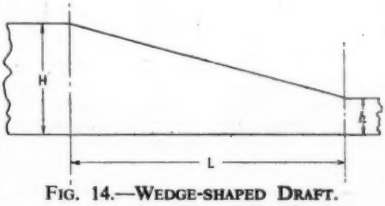


FIG. 14.—WEDGE-SHAPED DRAFT.

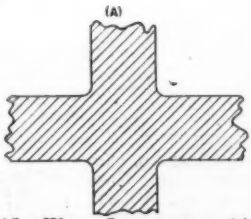


FIG. 15.—WALL JUNCTIONS. (*a*) INCORRECT; (*b*) CORRECT.

Casting Design

1:2, it may take the form of a fillet; where the difference is greater, the form used is that of a wedge.

Wedge-shaped changes in wall thickness are to be designed with a tapering not exceeding 1:4 (Fig. 14).

Recommended tapering is given in Table XI and in the Appendix.

TABLE XI.—*Recommended Tapering for Wedges*

a	*b*	*c*	*r*
10-15	15	3	5
15-20	20	4	5
20-25	25	5	5
25-30	30	6	8
30-35	35	7	8
35-40	40	8	8
40-45	45	9	10
45-50	50	10	10
50-55	55	11	12
55-60	60	12	12
60-65	65	13	15
65-70	70	14	15
70-75	75	15	15

The radii of fillets should be from 1.6 to 1.3 of the cross-sections which they connect. Larger radii in the fillet (equal to the thickness of the walls or greater) are not to be recommended, as this leads to local thickening.

U.S.S.R. Government Standard No. 2716-44 recommends the following series of radii for cast fillets, depending on general dimensions. This standard was produced by the Moscow Machine Tool Institute.[4]

Radii (mm.): 1.0; 2.0; 3.0; 5.0; 8.0; 10.0; 12.0; 15.0; 20.0; 25.0; 30.0; 40.0.

The number of radii in fillets used in one pattern should be the minimum possible and, where possible, should not exceed one.

A total of 742 fillets was measured, and the following frequency obtained:—

Radius of fillet in mm.	3	4	5	6	7	8	9	10
Frequency of occurrence, per cent.	1.7	0.7	24.5	1.5	0.1	4.7	0.1	48.8
Radius of fillet in mm.	12	15	16	20	23	24	25	28
Frequency of occurrence, per cent.	0.1	1.9	0.4	6.9	0.4	0.4	1.5	0.3
Radius of fillet in mm.	29	30	35	36	40	50	52	75
Frequency of occurrence, per cent.	0.3	1.3	0.8	0.1	0.5	1.1	0.5	0.1

In order to avoid local masses of metal and secure even surfaces at rounded angle junctions between two different sections, the external radius of the junction

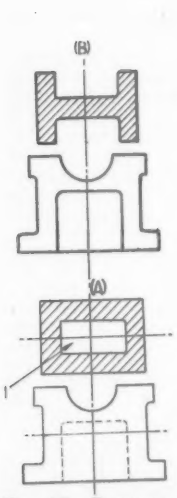


FIG. 16.—BEARING. (*a*) INCORRECT; (*b*) CORRECT. (NOTE: A CORE IS NECESSARY.)

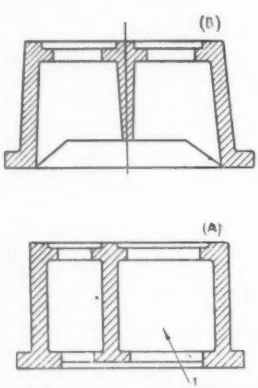


FIG. 17.—BASE. (*a*) INCORRECT; (*b*) CORRECT. (NOTE: CORES ARE REQUIRED AS SHOWN AT 1.)

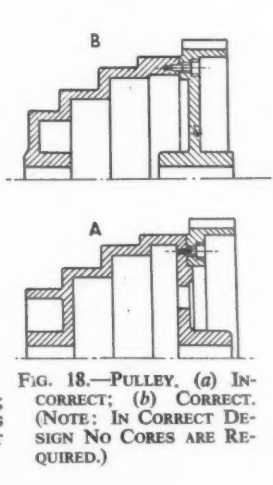


FIG. 18.—PULLEY. (*a*) INCORRECT; (*b*) CORRECT. (NOTE: IN CORRECT DESIGN NO CORES ARE REQUIRED.)

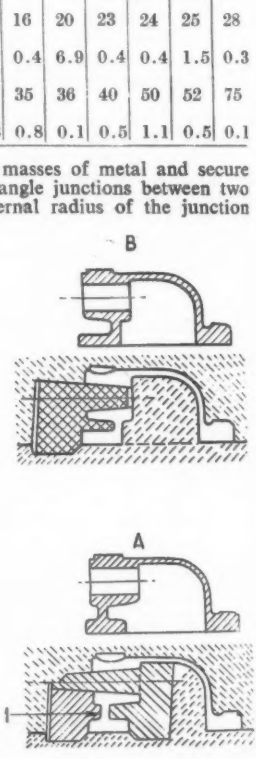


FIG. 19.—GEAR COVER. (*a*) INCORRECT; (*b*) CORRECT. (NOTE: ASSEMBLY OF THE MOULD IS COMPLICATED.)

[4] The Author, with a view to discovering the diameter of fillets actually used in practical work in various types of machine, measured 150 iron castings in 14 machines: six presses, four machine tools and four tractor engines.

should equal the thicker member, and then should follow the U.S.S.R. Government Standard No. 2716-44.

Cross-jointed walls (ribs) should preferably be designed as double T-forms (Fig. 15). Sharp inner angles should be avoided, as these form a focal point for the accumulation of local stresses. Acute angles are particularly dangerous in designs that may induce fatigue.

In order to lessen the mass of metal in those angles where a perpendicular strengthening rib meets two walls, the design should allow for an opening in the rib which does not weaken the construction, but makes for a good casting.

In designing changes in cross-sections, the engineer must remember that some of the walls will have a bigger thickness due to machining allowances.

Hollow Castings and Bores

In designing castings, all shapes which make the use of cores necessary should be avoided to the greatest possible extent, as they complicate moulding and increase its cost. Wherever possible, dry cores should be discarded in favour of green mould (Figs. 16, 17 and 18).

The question of whether or not a bore should be made by casting must be decided individually for each case, and depends on the nature of the job and the technology of its fabrication.

Allowances for cored holes, the size of which is the factor determining whether the hole shall be cored or not, should be calculated in accordance with existing practices. Tables XII and XIII show the recommended allowances.

TABLE XII.—*Allowances for Machining in Case of Single Cored Hole*

Greatest diameter in mm.	Maximum allowances by degrees of accuracy		
	I	II	III
Up to 100	3	4	5
100-200	3	5	6
200-300	5	6	8
300-500	6	8	10

TABLE XIII.—*Allowances for Machining in Cases of Several Cored Holes*

Greatest dimension of casting in mm.	Maximum allowances for machining by degrees of accuracy		
	I	II	III
Up to 22	4	5	6
200-300	5	6	7
300-500	6	7	8
500-800	6	8	10
800-1,200	8	10	12
1,200-1,800	10	12	14
1,800-2,600	10	14	16
2,600-3,800	—	14	16
3,800-5,400	—	18	20
Over 5,400	—	20	22

When a large number of cores is required for a casting, such as in the case of cylinders of air-cooled engines, for example, the question of unification must

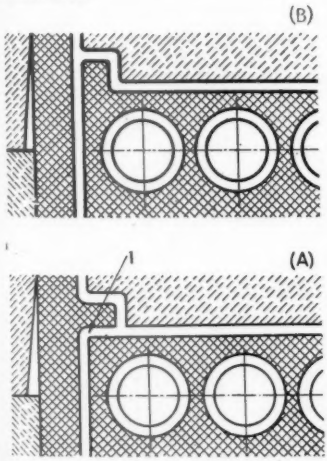


FIG. 20.—CYLINDER BLOCK. (*a*) INCORRECT; (*b*) CORRECT. (NOTE: THE INSET "1" HINDERS THE PLACING OF THE CORES.)

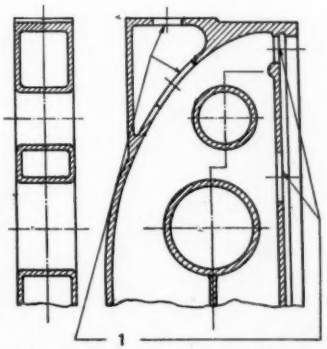


FIG. 21.—TRANSMISSION HOUSING. (NOTE: THE OPENINGS ARE FOR CORE PRINTS.)

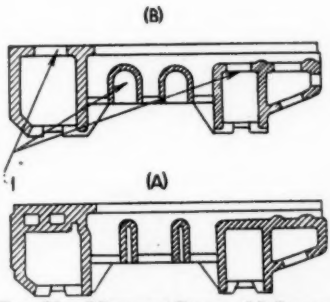


FIG. 22.—MACHINE BASE. (*a*) INCORRECT; (*b*) CORRECT. (NOTE: THE CORE AND CORE PRINTS SHOULD BE BIG ENOUGH.)

Casting Design

be considered. The design should favour mechanical core moulding.

The design of the interior of a hollow casting should be such that the core print and the shape of the core enable it to be accurately fixed in position. The core print should, where possible, be a continuation of the body of the core (Figs. 19, 20 and 21). The use of chaplets is extremely undesirable.

When the length of a core is more than double its diameter, the designer should allow for it to be fixed at both ends.

The thickness of the core should be sufficient to allow it to be strengthened by wire or cast core irons; it should not be easily broken during transportation or under the pressure of the liquid metal when the mould is filled (Fig. 22). The design of the casting should allow for the escape of gases from the core, preferably from the top of the casting. It is recommended that walls be strengthened by means of flanges wherever there is an opening in the casting.

The design of the casting should allow for the easy removal of the core and core iron from the casting and for the cleaning of the interior surfaces. If the job is one that requires entirely enclosed internal surfaces, the design must provide openings for the removal of the core, and for their closing after removal.

Ribs and Brackets

As far as possible, ribs should be flat in shape. If the ribs are narrow and high, stresses may occur at the outer edges, which may lead to cracks. The junction between the ribs and the main casting should prevent any local accumulation of metal.

For the same reason criss-cross ribs should be arranged checker-board fashion. When the thickness of flanges differs greatly from that of the body of the casting, the change in thickness should be gradual and tapered 1:4:5 (Fig. 23). Grooves should be made by casting if the unmachined dimensions are not to be less than 5 to 6 mm. in depth and 20 to 25 mm. in width.

Bosses and Lugs

Bosses, lugs, brackets and all other protruding sections or parts of casting should be so designed that they can be removed from the mould together with the main pattern (Fig. 24).

To obtain good, strong metal in bosses and lugs, their thickness should not differ greatly from that of the main casting.

When there are several lugs and bosses on one surface, they should be joined.

Bosses should not be included in the casting design when the surface to support bolts, etc., may be obtained by milling or countersinking.

Lugs should be thick enough to ensure that they can be machined without the main casting being touched. Minimum recommended heights for bosses on a casting are:—

For jobs up to ½ metre in length	5 mm.
For jobs up to 2 metres in length	15 mm.
For jobs over 2 metres in length	25 mm.

To avoid frequent change of position in planing or milling the various lugs, all those on one side of the casting should, if possible, be in one plane.

The width of lugs, supports, etc., should be compatible with some slight distortion in casting.

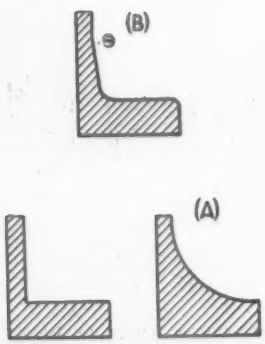


FIG. 23.—FLANGE. (*a*) INCORRECT; (*b*) CORRECT.

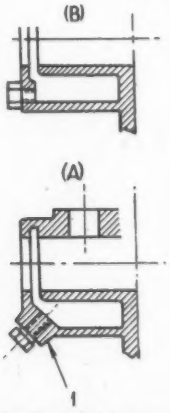


FIG. 24.—BOSS. (*a*) INCORRECT; (*b*) CORRECT. (NOTE: A LOOSE PATTERN PIECE IS NECESSARY.)

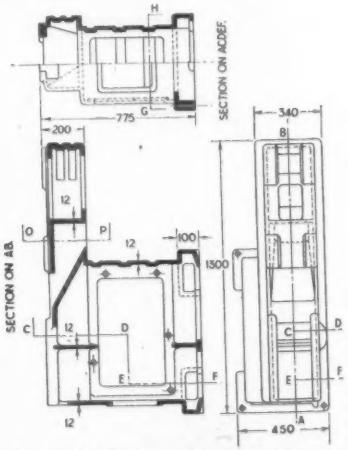


FIG. 25.—GENERAL VIEW OF MACHINE BED.

Some Examples of the Technological Analysis of Casting Designs

Machine-tool Bed.—The base of the casting (Fig. 25) is an open box with two sleeves, which are a continuation of the slide ways of the bed. In two walls penpendicular to each other there are openings that have to be closed with covers. The dimensions of the bed are 1,300 × 775 × 450 mm.

The original thickness of the walls was 12 mm. In view of the somewhat intricate shape of the bed, however, and especially the change in direction of the members hindering the flow of the liquid metal when poured and also to ensure even cooling in all cross-sections of the casting, the thickness of the outer walls is preferably increased to 16 mm.

The irregular shape of the walls forms a labyrinth through which the metal must flow; this may cause

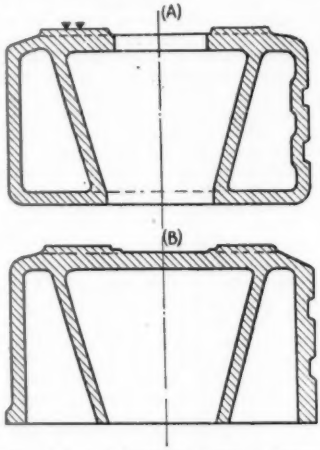


FIG. 26. — MACHINE BED. CROSS-SECTION OF WAYS. (*a*) INCORRECT; (*b*) CORRECT.

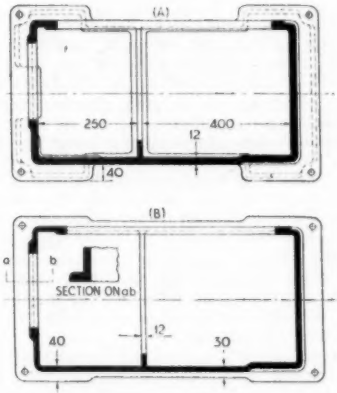


FIG. 27.—MACHINE BED. CROSS-SECTION OF THE BASE. (*a*) INCORRECT; (*b*) CORRECT.

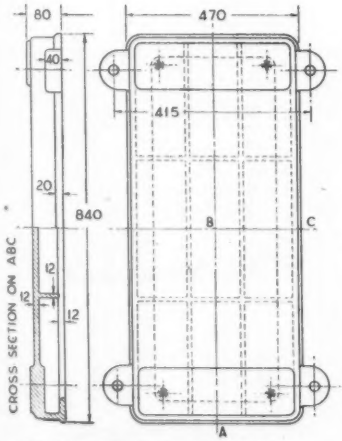


FIG. 28.—BEDPLATE FOR MOTOR, AS DESIGNED.

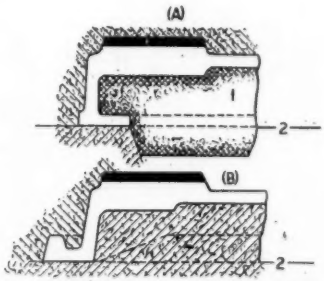


FIG. 29.—BEDPLATE FOR MOTOR, WITH EXTERNAL FLANGES TO SIMPLIFY MOULDING. (*a*) INCORRECT; (*b*) CORRECT. (1) A CORE; (2) PARTING LINE.

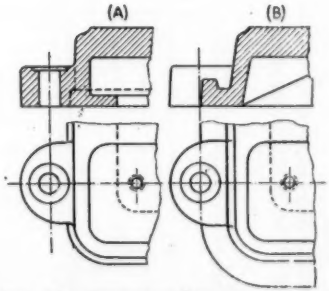


FIG. 30.—BEDPLATE FOR MOTOR. EXTERNAL FLANGES MAKE A STRONGER JOINT WITH THE FOUNDATION. (*a*) INCORRECT; (*b*) CORRECT.

Casting Design

washing,* due to the sand being washed away from the sides of the mould. Without changing the outer surfaces of the walls the inner surfaces should be made flat (Fig. 26).

The tubular section of the members as at first designed did not allow for the setting of the cores. To fix the cores securely and to make it easier to insert the cores in the mould, it would be better to make the tubular members in the shape of an inverted V (Fig. 26).

The design of the lower part of the bed is unnecessarily complicated, and can be replaced by ordinary flanges (Fig. 26), thus avoiding the unnecessary use of cores and giving stability to the mould.

Engine Base.—The use of internal flanges greatly complicates moulding. A number of cores must be used which, although they are of simple shape, are big, heavy, and involve great expenditure of labour. In consequence of this. coreboxes and drying plates are necessary. Changes in the design of the flange (Fig. 29) enable the foundryman to use green mould.

The strengthening ribs should be made somewhat lower and at the same time thicker to allow for the even cooling of the casting (Fig. 30). Reducing the number of ribs, decreasing their height and increasing their thickness simplifies moulding, especially if the whole job is given sufficient taper.

The lugs for bolting the bed to the foundation are inadequately attached, and may be broken off. By using an outside flange half the length of the lugs merges into the bed, which considerably strengthens them (Fig. 29).

* Possibly scab is meant.—EDITOR.

Spindle Housing.—The basic casting is a rectangular box with an inside arch, the dimensions are 100 × 950 × 950 mm. The casting is open at one side. The original design required a wall thickness of 20 mm., but on account of a number of lugs, ribs, etc., it was found that the walls were not strong enough, and the box cracked owing to the mechanical impediment of shrinkage; the thickness of the walls was therefore increased to 25 mm. At the same time an arch and a strengthening rib were introduced into the design, which made it possible to cast the job without cracks.

The edges of the internal surfaces should be straight and strengthened by a flange (Fig. 32). The core, and consequently the pattern and the corebox, then form one straight line. This simplifies the cores, makes it easier to manufacture and dry them, and, what is more important, ensures greater accuracy in assembling the mould and checking the dimensions. The producing of the pattern and the coreboxes is made simpler and cheaper. The height of the box should be increased by 20 to 40 millimetres in order to strengthen the flange.

The brackets of the box have a width and thickness which are not proportional to the thickness of the box walls (Fig. 33). The necessary allowances for machining increase the mass of metal still further giving a ratio of thickness 50 : 25 mm.

The supporting arch with the opening by which the housing is fastened to the bed is subject to serious internal stresses due to the difference in the mass of metal in the parts of the casting adjoining it. The cores necessary to make this part are too complicated.

The supports in the bottom of the box have the following two technological defects:—(1) The mass of metal is disproportionately great as compared with the thickness of the bottom; and (2) the strengthening rib connecting the supports with the vertical walls of the

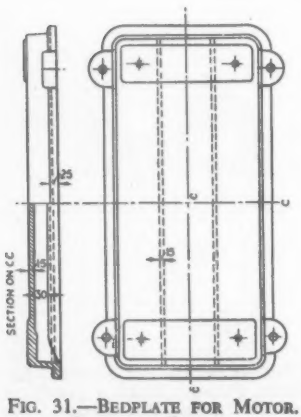


FIG. 31.—BEDPLATE FOR MOTOR. IMPROVED DESIGN.

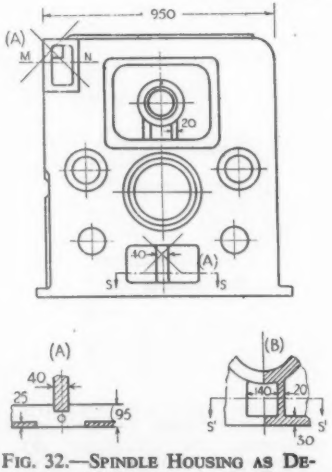


FIG. 32.—SPINDLE HOUSING AS DESIGNED. (*a*) INCORRECT. (*b*) CORRECT.

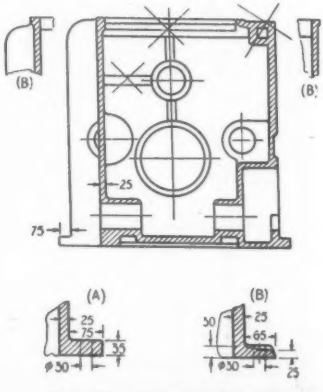


FIG. 33.—SPINDLE HOUSING —RIBS AND FLANGES. (*a*) INCORRECT; (*b*) CORRECT.

box hinders free shrinkage. It is more rational to design a system of supports joined only with the bottom of the box, with a corresponding simplification of the whole design (Figs. 34, 35, *a* and *b*).

The original shape given to the strengthening ribs does not justify their existence, and they can be avoided altogether by the change of design described above.

The beading on cored holes is of excessively massive design, especially when one takes into consideration the additional thickness that must be given them to allow for machining.

The part carrying the electrical instruments should be designed separately in the form of a box or a bracket to be bolted on to the walls of the main construction (Fig. 36).

The inclusion in one casting of elements of primary importance that are subjected to a heavy mechanical load and those of secondary importance only serves to complicate the design and is incorrect in principle. The design of this casting is already complicated and requires 20 cores. The chief economic effect in redesigning castings from the standpoint of the processes involved in the pouring, solidifying and setting of the metal will be shown by a reduction of scrap.

At the same time, simplifying the processes means a reduction in the amount of labour required to make the pattern equipment and moulding, also cleaning the castings. For example, the above-mentioned changes in the design of spindle housing reduces the time required to make patterns and coreboxes from 462.2 hrs. to 416 hrs., that is, by 10 per cent. The time required to make the cores is reduced by 35 min., the assembling of them by 7 per cent., and the actual moulding by 6 per cent.

(*Continued overleaf, col.* 2.)

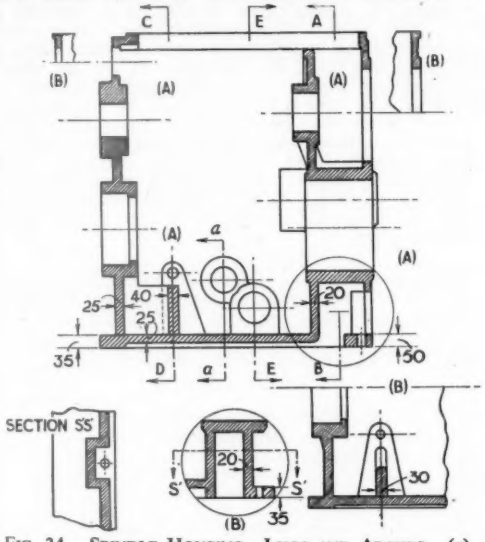


FIG. 34.—SPINDLE HOUSING—LUGS AND ARCHES. (*a*) INCORRECT; (*b*) CORRECT.

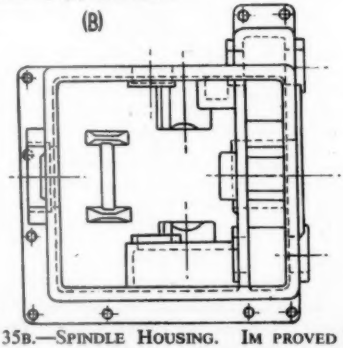


FIG. 35B.—SPINDLE HOUSING. IM PROVED DESIGN.

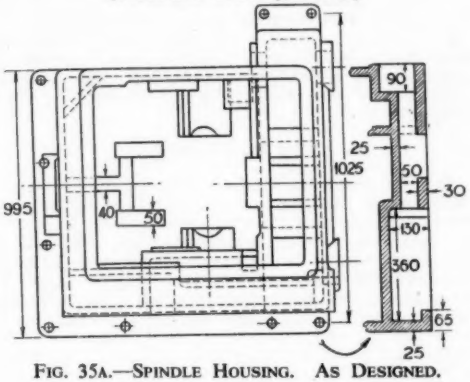


FIG. 35A.—SPINDLE HOUSING. AS DESIGNED.

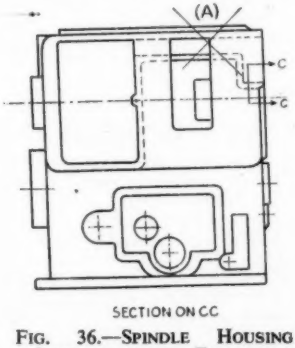


FIG. 36.—SPINDLE HOUSING SUPPORT FOR THE ELECTRICAL INSTRUMENT. (*a*) INCORRECT.

FOUNDRY HISTORY

Claims that the foundry industry is one of the oldest known to man were ably proved by Mr. B. L. Simpson, of the National Engineering Company, U.S.A., at a meeting of the Twin City Chapter of the American Foundrymen's Association. He traced the origin of the industry to the year 4,000 B.C., when copper was being cast for weapons, using clay and sandstone as mould materials.

Cast iron was first developed in China about 2,000 B.C., using stone for moulds, and the Chinese are credited with pouring the largest single casting ever made about the year A.D. 502. Cast steel was developed in India. The Egyptians developed the lost-wax process of moulding, and cores were developed, not for internal shaping, but to save metal on a piece-price basis. Progress was stopped for several centuries during dark ages in Europe, although some work was done by the monasteries to acquaint people with foundry practice. Molten iron came into use about A.D. 1200 and loam moulding appeared about A.D 1300. Around A.D. 1700 progress again appeared in discovering new metal techniques and methods of melting and moulding. Metallurgical analysis was started in approximately A.D. 1700, and also the sand moulding method came into use with wood patterns for open-type moulds.

First Blast Furnace

The first blast furnace was installed in America in 1622, and in 1742 the first casting was made in Lynn, Mass., at the Taylor Wharton Iron & Steel Company, a concern that is still operating to-day. Several of the signers at the Declaration of Independence were well-known foundrymen of their day. Since the beginning of the 1800's, foundry science has advanced rapidly, chiefly due to manufacturers specialising in furnishing foundry equipment. Developments of the 1800's include ladles, overhead conveyors, moulding machines in 1837, sand mixers in 1880, and core baking in 1887. Foundry practice has advanced very rapidly since the middle eighties to its present state of mechanisation and improved working conditions, and the rate of development shows no indication of slacking off.

NEW STANDARDS ISSUED

The monthly information sheet of the British Standards Institution reports the issue of the following new standards:—1228: 1945, door bolts, iron, steel and non-ferrous (2s.); 1254: 1945, W.C. seats (plastics) (1s.); 1255: 1945, brackets and supports for lavatory basins and sinks (2s.); 1269: 1945, titanium pigments (rutile type) for paints and titanium white types 6 and 7 (including amendment No. 2 to B.S. 636: 1935) (2s.); PD 402, schedule to STA 7: group 1, copper and its alloys (2s.).

The following standard has been cancelled:—1074: 1942, fireclay bases for use with open coal fires.

BOOK REVIEW

"Methods of Testing Prepared Foundry Sands—First Report of the Joint Committee on Sand Testing." Published for the Committee by the Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester, 3. Gratis to the members of the co-operating organisations and 10s. 6d. to non-members.

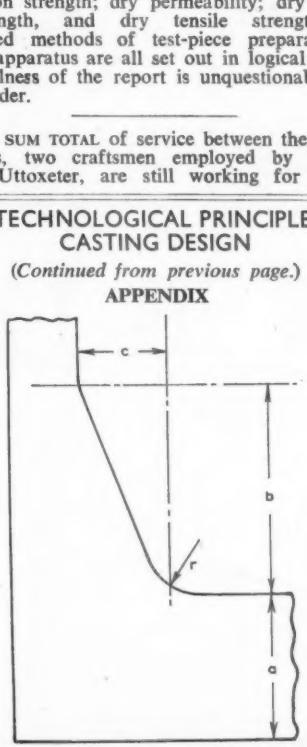
Few people are aware of the extent to which the literature of foundry sands has grown. Moreover, as but a modicum is of a fundamental character, it has been found necessary from time to time to revise notions and modify apparatus. In this 36-page booklet, the whole subject is reduced to essentials as they exist to-day. It is commendable that attention is called to the underlying concept of permeability, as it brings into relief the limitation of the test results to workshop control and to their exclusion from the field of true research. The scope of the report is limited to moisture content; green permeability, green compression strength; dry permeability; dry compression strength, and dry tensile strength. The standardised methods of test-piece preparation and available apparatus are all set out in logical sequence. The usefulness of the report is unquestionably of the highest order.

WITH A SUM TOTAL of service between them of over 120 years, two craftsmen employed by Bamfords, Limited, Uttoxeter, are still working for the firm.

THE TECHNOLOGICAL PRINCIPLES OF CASTING DESIGN

(*Continued from previous page.*)

APPENDIX



This figure illustrates the recommended tapers to be given to wedges as detailed in Table XI.

BRITISH CAST IRON RESEARCH ASSOCIATION

ANNUAL REPORT FOR 1944-45

Although the year under review was largely occupied in work arising from the war effort, considerable progress has been made with post-war plans envisaged by the Council. A new subscription basis was adopted and approved by members. As a result a new arrangement, details of which are given below, was made with the Department of Scientific and Industrial Research, following a deputation to the D.S.I.R. Advisory Council. This arrangement began as from July 1, 1945, for a five-year period. There has been considerable activity on the part of the Council's committees, sub-committees and panels.

Council and Officers

The annual general meeting was held in London on December 6, 1944, the president, Mr. P. Pritchard, taking the chair. The president and vice-presidents in office were re-elected and the Council re-elected Dr. Harold Hartley as chairman. Six meetings have been held, together with 15 meetings of the Executive Committee. Dr. J. E. Hurst was re-elected chairman of the Research Committee, of which five meetings were held, and Mr. T. M. Herbert, chairman of the External Relations Committee, which held four meetings. The Development Committee elected Mr. P. H. Wilson as chairman and Mr. J. J. Sheehan as vice-chairman and have held three meetings. Twenty-two meetings of Research Sub-committees and their panels have taken place, together with six joint meetings with other bodies. The aggregate number of meetings exceeds pre-war totals. Six meetings were held at Alvechurch and the remainder in London, Glasgow, Birmingham, Falkirk and Derby.

In common with the industry and the enterprises which he so ably conducted, the Association suffered a serious loss through the death on February 2, 1945, of its president, Mr. Percy Pritchard. In view of the importance of negotiations taking place at that time between the Association and the Department of Scientific and Industrial Research, the Council decided to invite its chairman, Dr. Harold Hartley, to become president-elect and to recommend his nomination to the office of president at the annual meeting.

The end of the period under review corresponds approximately with the termination of hostilities and hence the year was again mainly occupied in work concerning the war effort.

Research

The major part of the work done comprised either experimental work directly undertaken for various official departments, or the continuation of such parts of the general programme as were of direct use in connection with war requirements. A lengthy investigation on residual elements in whiteheart malleable cast iron, which were suspected of influencing the manufacture of munitions components, was completed for and reported to the Ministry of Supply, and other wartime investigations are in process of completion. Work on the acicular engineering irons continued and two reports have been made available. An investigation on the properties of a group of well recognised ladle additions with respect to their chill-removing properties and effect on strength was completed. The application of the photo-electric absorptiometer to the analysis of cast iron has been studied and two reports have been issued. These created such interest among users of the instrument that a panel was formed to study the implications of the whole matter. The application of spectro-chemical methods to the analysis of cast irons has also been studied, and although no report has yet been issued, the work done on this instrument continued to increase and at the present time one analytical determination in four carried out by the Association is done by the spectroscope; it is being used for the determination of silicon, manganese, nickel, chromium, copper, molybdenum and vanadium within the limits found in normal cast irons, for which the necessary standards have been prepared. In addition, research work continues on the determination of these elements present in amounts outside the usual ranges, on the determination of other elements and particularly on the determination of trace or residual elements present in small quantities. In common with other workers in this field, the Association is confined to the use of samples of melts cast in the white state, but further work is in progress to see whether samples grey as cast, in the ordinary way, can be treated.

Graphite Formation

Fundamental work on graphite formation has been continued and the senior research officer has given two talks on the subject to the Research Committee. The study of inclusions and gases has also been enhanced by the installation of a vacuum fusion furnace which will soon be available for the determination of total oxides and gases in metal in both the solid and molten states. The aluminium reduction method is also available for the determination of total oxides. In connection with ingot moulds, work has been done on the properties of ingot mould irons at elevated temperatures, but much has been held up pending the installation of a special testing machine which will permit extensometer measurements at elevated temperatures.

Much work has been done on possible substitutes for linseed oil in core sands and a report has been issued showing that certain petroleum extracts can be used up to about one-third of the linseed oil normally used. The work of the Joint Committee on Sand Testing has been resumed and its first report is in the press.

Among reports issued relating to improved methods of testing, one covers an immersion thermocouple

British Cast Iron Research Association

for the direct determination of molten metal temperatures. This is a portable instrument and gives readings free from the uncertainties associated with other types of pyrometer for molten metal temperatures. A tungsten carbide pyramid has also been used for the determination of hardness, in place of the Brinell ball test, which is apt to be erratic with very hard material. Other work done includes an examination of high-speed steel scrap, much of which is now available, as a constituent in the manufacture of high-duty cast iron.

Like others concerned with the preparation of specimens for micro-examination by polishing, the Association was greatly handicapped by the cessation of supplies which were imported before the war. As substitutes did not prove satisfactory, the Association developed an alumina type polishing powder for ferrous metals which was so well received by members who tried it that arrangements were made for the material to be prepared by and obtainable from Cooke, Troughton & Simms, Limited, York.

The metallurgical work of the Association is in charge of Mr. H. Morrogh, senior research officer. During the year the chemical research work was separated from the work of the analytical laboratory and placed in charge of Mr. W. Westwood. Experimental work on sands remains in the charge of Mr. W. B. Parkes.

Development

Dr. H. T. Angus took up his duties as manager of the Development Department on January 1, 1945, and during the year the Department actively continued its work in dealing with inquiries received from members, of which some 1,200 were dealt with. Special efforts have been made wherever possible to visit members in connection with such inquiries, and, for example, during the first half of 1945 over 80 such visits were paid to some 60 member firms, over half these visits taking two or more days. The Department had also planned a detailed investigation of Scottish sand deposits which was to have been undertaken by Mr. W. B. Parkes, who was appointed assistant manager to the Development Department as from January 1, 1945. Owing to the unfortunate breakdown in health of Mr. T. Tyrie, superintendent of the Scottish laboratory, this work had to be curtailed, but one deposit has been examined which closely resembles in strength, permeability and grading the better-known English sands.

The Ironfounding Industry Fuel Committee of the Council of Ironfoundry Associations, of which the director acted as chairman and Mr. W. J. Driscoll as fuel officer, terminated its work at the end of the period under review, and Mr. Driscoll was appointed to take charge of a new division of the Development Department dealing with engineering uses of cast iron, designed to provide the same service for engineering and industrial users as is provided by the Building Uses Department for building and domestic users. The Fuel Committee will continue its work as the Advisory Fuel Panel of the Council of Ironfoundry Associations. The Development Committee envisages considerable expansion of the work of the Department with respect to development proper and these plans will mature with the solution of pressing problems of staff and accommodation and with the winding up of the work in hand concerned with the war effort. Following the recommendations of the Light Castings Sub-committee, the Department is investigating the problem of warping and cracking of light castings in members' foundries on a statistical basis.

During the year the Anti-glare Advisory Committee, of which the director was chairman, terminated its work. The Committee supervised the expenditure of funds exceeding £100,000, of which approximately one-half was provided by Government grant. The type of anti-glare structure for cupola furnaces which took the form of a hood screening the upper part of the furnace has been shown to have various advantages as a dust-catcher.

Intelligence

Mr. W. L. Carter took up his duties as manager of the Intelligence Department as from January 1, 1945. Since the end of the year under review Mr. W. Ashworth has been appointed librarian. The Department supervises the Association's publications and the manager also acts as public relations officer in connection with Press contacts, publicity and public relations. Accessions to the library show considerable increase over the previous year as do loans of books, periodicals, pamphlets and lantern slides. The number of inquiries dealt with reached 264, compared with an average of 212 for the previous four-year period. The number of Press notices received was greatly in excess of previous years. During the year 13 research reports and seven external reports have been issued, and four translations have been made available to members.

The "Bulletin and Foundry Abstracts" appeared regularly during the year. From July 1, 1945, the beginning of the eighth volume, it resumed publication of six issues per annum in enlarged form. In addition, the separate issue of research reports in printed or in typescript form has been abandoned, and confidential reports are now circulated to all members at periodic intervals in the "Journal of Research and Development." The first number of this appeared in August, 1945, and it is also being issued six times per annum, alternately with the "Bulletin," so that ordinary members have one publication each month. The individual reports issued in the "Journal" are also available for the use of new members in reprint form. The improved "Bulletin" and the production of the "Journal" have been favourably commented on by members.

A number of lectures have been given during the year, including four by the director, two to the branches of the Institution of Mechanical Engineers.

Building Uses

The Building Uses Department was opened on July 1, 1944, in order to provide an impartial and authoritative source of information for builders,

architects, surveyors, local authorities, students and other *bona fide* inquirers with respect to the architectural, building and domestic uses of cast iron. Mr. D. L. Bridgwater, B.Arch., F.R.I.B.A., was appointed consulting architect to the Department, which has the cordial co-operation and support of the British Ironfounders' Association. During the year a number of inquiries have been received and dealt with and a number of visits paid to foundries and other establishments. A collection has been made of photographs and drawings illustrating the historic and contemporary uses of cast iron in building and architecture, to fill in the background for Press articles, exhibitions and lectures. In December, 1944, an exhibition was held at Alvechurch to members of the architectural and building Press, who spent a day visiting the exhibits and inspecting the work of the Association as a whole. A pamphlet relating to building uses was prepared for the occasion and a considerable number of Press articles and references have since been received. Part of the exhibition was repeated on the occasion of the Association's annual Open Day for members on June 27, 1945. Some exhibits were also shown in May, 1945, as a special section of the Housing and Town Planning Exhibition organised by the military authorities of the Southern Command at Aldershot, visited by over 6,000 members of the forces interested in post-war planning. Further requests for information have been received from other military and R.A.F. centres. Exhibition material has also been sent to Henley-on-Thames for a Three Counties Housing and Town Planning Exhibition in October last and to Newbury and District Council for a Housing and Town Planning Exhibition in November.

Several lectures have been provisionally arranged and the director has undertaken to lecture to the Royal Society of Arts in April, 1946, on contemporary building and engineering uses of cast iron. Mr. Bridgwater represents the Association on several B.S.I. committees dealing with cast iron for building uses. Articles providing authoritative information have also been supplied to two architectural publications, and the "Official Architect" issued a special cast-iron number in May, 1945, devoted entirely to various aspects of cast iron and its applications. The Building Uses Department is keenly interested in the proposals of the Council of Industrial Design, set up in December, 1944, by H.M. Government, and in the proposed exhibition, to illustrate British design, in 1946.

Laboratories

The work of the laboratories during the year has aggregated only slightly less than the peak figures for the war period 1942-44, but the reduction has permitted a greater concentration on the research programme and in particular the construction of apparatus and equipment.

At the end of May, 1945, Mr. T. Tyrie, B.Sc., superintendent of the Scottish laboratory, suffered an unfortunate breakdown in health and has been given extended sick leave by the Council. We are glad to report that Mr. Tyrie is making steady if slow progress. Following a period during which the laboratory was serviced by members of the staff from headquarters, Mr. W. L. Proctor, B.Sc., was transferred from headquarters as acting superintendent of the Scottish laboratory Mr. Proctor graduated with honours in metallurgy at the University of Manchester in 1937 and subsequently followed an apprenticeship course at Radiation, Limited, during which he took the diploma for the British Foundry School. After further foundry experience he became metallurgist and later general manager of James & Company (Birmingham), Limited.

Accommodation and Equipment

During the year the equipment of the Association has been steadily increased and the land, buildings and equipment are now valued at cost at £40,000. The Council has under consideration schemes for extending the accommodation available, the need for which has been stressed by several committees of the Council. The annual Open Day for members was held on June 27, 1945, with an attendance of 150. Visits have also been paid by the local branch of the Institute of British Foundrymen and the Staffordshire Iron and Steel Institute. The number of visitors received at headquarters has averaged about two per working day.

Finance and Membership

The statement of accounts shows an income for the year rather less than the record for 1943-44, but higher than was anticipated in view of the inevitable reduction of income with the falling off of purely wartime activities. In view of the termination as at June 30, 1945, of the agreement with the Department of Scientific and Industrial Research, which had run for six years, the Council submitted a new scheme through a deputation consisting of Dr. Harold Hartley, Mr. P. H. Wilson, Dr. J. E. Hurst, Mr. T. M. Herbert, Mr. A. E. Pearce and the director, to the Department's Advisory Council. The Council of the Association considered that the time was ripe to settle the broad lines of the Association's post-war development which the acquisition of new premises had made possible. They decided that an effort should be made to double the ordinary grant-earning subscription income from the industry, excluding voluntary increases in recent years. The basis subsequently offered by the Advisory Council to the D.S.I.R. and approved by the Council for acceptance provides that the Association shall secure from the industry a minimum industrial income of £18,000 per annum, for which the D.S.I.R. will provide a block grant of £9,000. This will ensure a minimum income of £27,000 per annum, or, with miscellaneous non-grant-earning income, say, a total of £30,000 per annum. This, in fact, is less than the income for 1942-43 to 1944-45. In addition, however, the Department has undertaken to supply supplementary grant of £100 for each £100 of subscription income received over and above the minimum of £18,000, up to an additional figure of £9,000. In other words, for £9,000 of subscription income over and above the basic £18,000, a further £9,000 can be earned.

British Cast Iron Research Association

This makes possible a total income of £45,000 per annum, or, say, with miscellaneous non-grant-earning income from various sources, £50,000 per annum.

The achievement of this income during the next few years will place the Association in an excellent position to reach the income of £100,000 per annum envisaged as a desirable income for an industry of the magnitude involved. In order to accomplish this, however, some form of levy by which the cost of research and development can be equitably distributed over the whole industry will be required. In this connection it is of interest to note that under a recent law in France, French manufacturers of castings are required to add 1 per cent. of the cost of all invoices for research and experimental work, one-half of which is transmitted to a central body for the encouragement and conduct of research, the balance being utilised by the manufacturer himself under conditions which compel him to transfer any ultimate unexpended balance to the central fund.

In this connection it is of interest to note that Mr. H. H. Berresford, president of the Joint Iron Council, at its first convention, stated that the annual turnover of the iron industry, including ironfounding and the production of foundry pig and refined iron, was of the order of 120 to 150 millions sterling.

In order to raise the increased subscription income it was necessary to establish a new subscription basis, and after careful consideration the Council decided that members having ironfoundries should contribute on a scale determined by the labour employed and the subscription was fixed at £20 plus 2s. 6d. per £100 of foundry wages paid during the previous calendar year. The basis was duly approved by members at an extraordinary general meeting on March 28, 1945, and the returns received to date indicate that the required minimum will be assured. For other members of all grades a fixed annual subscription has been arranged.

Relations with Other Bodies

Co-operation has been maintained with a number of scientific and technical bodies. The Association has watched with keen interest the progress of the Council of Ironfounding Associations (C.F.A.), under the chairmanship of Mr. FitzHerbert Wright (vice-president of the Association), and the establishment of the Council of Iron Producers, that is, producers of foundry pig and refined irons. These movements have been followed by the formation of the Joint Iron Council, comprising the two bodies in recognition of their common interests, under the presidency of Mr. H. H. Berresford. The Association has co-operated extensively with these bodies, for example, on the C.F.A. Education Committee; on the J.I.C. Advisory Technical Committee, of which Dr. J. E. Hurst is chairman, and the Fuel Committee. The director has also, on behalf of these bodies, assisted in the organisation of foundry teams to visit German foundries.

In view of the interest taken by members in the British Foundry School, it may be said that during the year strong representations were made by the industry that the school should be reopened and a Committee appointed by the governing body has this under active consideration with a view to making plans for an early resumption of its activities on a larger scale than before the war.

The Council believe your Association is steadily developing a vigorous research and development programme designed to benefit substantially the ironfounding industry on the widest possible basis, and to serve both the home and export markets. Your Association will continue to take an ever-increasing active part in foundry research and allied activities directed to be of the maximum assistance to members of all grades, and earnestly invites their co-operation to this end, and in securing the support of non-members.

The report is signed by Dr. Harold Hartley, chairman of Council, and Mr. J. G. Pearce, director and secretary.

NEW CATALOGUES

Melting Furnaces. A 36-page, well-illustrated brochure received from Lees Hall & Sons, Limited, of 113, Whitehouse Common Road, Sutton Coldfield, Warwickshire, covers a particularly wide range of furnaces and other foundry requisites. The appearance, due no doubt to paper restrictions, is somewhat spoilt on pages 2 and 3 by having the letterpress and illustrations printed sideways. The plant described includes crucible tilting furnaces, both central and tip axis; semi-rotary, reverbatory, both stationary and tilting: bale-out furnaces—a particularly wide range. Additionally, there are several types of lift-out furnaces. Most of those illustrated can be arranged for using as fuel town's gas, oil, or coke. Another line prominently featured is the supply of tippler moulds for casting slabs and ingots. Ironfounders might do worse than look into the type of plant for taking care of their over metal.

Motors. Higgs Motors, Limited, of Witton, Birmingham, 6, have just issued an abridged list of the main types of motors they manufacture. The feature which intrigued the reviewer most was an electric hand drier. Here a current of hot air replaces the hand towel and the risk of contracting a skin disease.

THE "NICKEL BULLETIN" for November includes abstracts dealing with the evaporation of metals, oxidation characteristics of nickel, iron and cobalt, inoculation of cast iron, relationship between hardenability and martensite, locomotive beds of cast nickel steel and some specialised uses of stainless steel. Copies may be obtained, free of charge, from the Mond Nickel Company, Limited, Grosvenor House, Park Lane, London, W.1.

COMPRESSOR CASTINGS*

By A. F. HAMMOND

The East Anglian section of the London branch of the Institute of British Foundrymen devoted an evening to the study of the various sytsems of inspection used in the foundry industry. As a basis, three Papers were submitted from local foundries, one of which makes steel castings, a second is a large repetition malleable-iron foundry, while the third has an excellent reputation as a maker of air compressors and the like. The Author of this article is on the staff of Reavell & Company, Limited, of Ipswich. The other two articles in the symposium—"Inspection of Rough Castings," by R. S. Durrell, and "Notes on Inspection," by R. J. Hart—will be printed in forthcoming issues.

It is proposed to deal briefly with the inspection and testing that has been proved necessary in the manufacture of castings, forming part of air compressors, exhausters, etc., produced in the Author's foundry, which is of the jobbing type. It is therefore laid out with tackle and equipment which affords the maximum of elasticity in use, rather than with standard single-purpose machinery, as is the case in quantity production shops. In producing pressure castings in high-duty iron complete soundness is essential. Soundness covers many phases in a casting. Generally speaking, and with reference to work from a jobbing foundry, it can be defined to mean that the casting is perfectly acceptable for the duty it has to perform, and contains no visible defect when leaving the foundry.

Customers' Specifications

A general specification by customers ordering castings is that they shall be free from blowhole porosity or sponginess, and cavities or cracks. It is with this in mind that the foundry sets about its task. Some customers specify test-bars, but it is axiomatic that soundness cannot always be measured by the performance of a test-bar.

The quality and soundness of a casting are influenced by the design and methods of manufacture in the foundry, of which all have as their primary object and aim to attain the ideal of equalisation of cooling rates and progressive solidification from the bottom upwards. Runners and methods of distribution can play a most important part towards this ideal. Castings of the machine-all-over type and those with complicated jackets, and water spaces, combined with many varying changes in section, are those which call for considerable ingenuity on the part of the foundryman. This was aggravated during the last year or so by materials being in short supply.

The type of castings produced in the Author's foundry can be graded as medium to light in weight, with sections ranging from ¼ in. to 1½ in. Castings for air compressors of all types and sizes form a major part of the work, air cylinders of all types, with complicated water jackets, air chambers, cylinder heads, pistons, liners, valve covers, to quote a few from a class where resistance to pressure and wear is of paramount importance. Many of these castings have very intricate coring to form the water jackets and air spaces, and it is essential that there should be no leakage from one compartment to the other. For example, the Q.R. type quadruplex single stage air compressor contains: (1) Water jackets; (2) air jackets; (3) cylinders cast in, and (4) staggered centres of cylinders. There are water tests of 50 lbs. for the water jackets and 150 lbs. in the air belt. Additionally, there is difficulty in measuring section thickness.

A further example is a 3-cylinder crankcase, with bores 11 in. dia. cast in and with a water jacket surround. The cylinder head of this machine also presents its difficulties because of internal walls and bosses. A cylinder head in the form of a box, which forms a water jacket and incorporates two valve pockets, is a typical example. The water-test pressure in the valve pockets is 900 lbs., and any slight weep is sufficient to condemn this casting.

Practice for Inspection

The examples indicated give an idea of the complications with which a foundry has to contend. The practice for inspection is as follows:

(1) The pattern is produced and made in accordance with the foundry requirements, always bearing in mind the tackle and equipment available. The pattern and boxes are always inspected before leaving the patternshop, and the foundry commence production only when methods of running, fixing or cores, and the grade of metal to be used have been decided.

(2) Inspection during moulding and coring up to eradicate any joints which may retard the chances of a good casting is one of the duties of the foundry executives.

(3) The casting having been produced, a preliminary visual inspection is made for any obvious defects after knocking out and before shot blasting.

(4) Further inspection is made of the casting after shot blasting and during fettling for thickness, general shape, and dimensions before despatch to the machine shops.

(5) The casting is subsequently set up for the first operation, and is examined by an inspector as it leaves each machine and before being set up for the next operation.

(6) It is during this procedure that any discrepancies or defects which may not have been apparent before despatch from the foundry become visual. Defects in a cylinder bore, duty on a machine face, slight porosity at a change in section, or a blowhole, are some of the defects that do present themselves, and it is at this stage that a decision is made as to whether the casting is usable or not.

(7) The casting that is passed as satisfactory is moved on to its next stage, of examination by a chief inspector for dimensional tolerance, and being again passed is sent along to the water-testing department.

(8) At the water test all joints are made secure, and most castings are tested independently, in preference to assembly and testing as a complete unit where one

*Slightly abridged.

Compressor Castings

casting failing often would mean the stripping down of a good part of that particular machine to get at the defective part.

(9) Whilst the casting undergoes this water test to a specified pressure an inspector stands by to check and pass or reject accordingly.

(10) The castings are next despatched to the fitting and erecting shops and so to the final erections.

(11) After erection a final water test is made to ensure complete circulation of the water, with no leakages at the joints, and with a general soundness of castings. From the erecting shops to the test house is the next and last stage, and every machine is tested to its full capacity and afterwards inspected before despatch to customers.

It is fully appreciated that the finished casting before being released from the foundry should be approved and passed as correct to drawing and free from any visual defects. Various methods of testing are used according to the class of job and the conditions of its production. Visual inspection and a complete knowledge of what is required of the job, together with the checking of thickness, positions of coring, and tendencies for growth are evident, and in these the practice in the Author's foundry has been found satisfactory.

Correct Section Thickness

As the greater part of the castings are of the machine-all-over type it is impossible to test the castings under pressure before leaving the foundry, and in many cases the intricate coring forming the water jackets and air belts make it extremely difficult to measure many of the thicknesses after casting. It is, of course, very important with this class of work that section thicknesses are correct, and it is only by supervision and inspection during the actual moulding that the standard is maintained. An easy way for the inspector to determine great inaccuracies in difficult castings in the foundry is by weight, but this only determines part of the troubles.

The crack detector for the examination of small castings has come into use in recent years, and in batch work has proved itself most valuable. Undoubtedly the X-raying of castings—as is now being used in the light alloy industry—has great possibilities in the ferrous foundries. Perhaps there was apprehension among foundrymen lest this system should be made compulsory by the various buying authorities, who are often inclined to adopt any new inspection system before they know thoroughly how to interpret the results.

There has been in the past a little uncertainty by designers and perhaps foundrymen, too, as to the soundness of a casting in its interior. With the aid of the X-ray used with the utmost discretion by people who know what requirements are necessary, the foundry will have a chance to prove that sound castings are being made, and the tendency for substitutes by some designers will not be justified.

WASTERS DUE TO RISERS

By "Coroner"

Scrap castings due to faulty riser technique are often difficult to diagnose, as there is usually no evidence in the scrapped casting to point conclusively to this cause, and often other faults may be given as the reason for scrapping a casting. Two castings which the writer examined at different times were scrapped according to the inspector for "slag," and the pouring crew were blamed.

Closer examination showed, in the one case, that the "slag" was essentially a lump of sand which floated to the top surface of the casting, near to a riser. The presence of the sand here suggested that this foreign matter—which was not caused by a scab, and which, because of the slag trap and stoppers used during pouring, could not have entered through the runner system—must have come from the mould itself. But how was a lump of sand in the mould at the moment of pouring? No moulder would be so careless as to leave such a cause of scrap in his mould, and it must have therefore dropped in after assembly. Watching the next mould being assembled gave the clue for the cause of the waster. After positioning the top half, the moulder placed sticks in the riser holes and made up the basins. Here was the cause of the trouble; not enough care was exercised in withdrawing the sticks; consequently, a certain amount of loose sand fell through into the mould.

To avoid this in subsequent castings, the tops were tried on, lifted to one side, and the runner and riser basins made up and then finally assembled. No further complaints were received from this type of defect since adopting the above methods.

A Case of "Slag"

The second case was actually one of "slag," an extensive patch of which was found on the top surface of a large vee-belt pulley. This, too, was in the vicinity of a riser, which was of ample size to act as a self-feeding head, as the job was cast in a high-duty iron and needed feeding to ensure solidity when the vee's were machined.

At first the defect was a mystery; how could slag pass the efficient trap provided? Passing through the shop at the time of pouring an identical casting, the writer was amazed to see the moulder with a spade in front of his face, gazing into an open riser of about 5 in. dia., unsuccessfully endeavouring with the aid of a bar to guide the scum floating on the surface of the metal in such a manner as to force it to ascend in the riser instead of floating out under the top surface of the mould. At once the cause of the trouble was apparent. The large open risers were allowing air to enter the mould and to react with the surface of the metal, forming "slag," which accumulated as the job filled.

Other pulleys cast from the same pattern, but with the risers closed down, turned out perfectly without the slightest blemish due to slag, and were perfect examples of the necessity for a careful control of all the innumerable variables in foundry practice.

INSTITUTE ELECTS NEW MEMBERS

At a meeting of the Council of the Institute of British Foundrymen, held at the Queen's Hotel, Birmingham, recently, the following were elected to the various grades of membership:—

FIRST LIST

As Subscribing Firm Members

Acieries de Haine-Saint-Pierre & Lesquin, Haine-Saint-Pierre, Belgium, steel founders; Koppel Engineering (Pty.), Limited, P.O. Box 5682, Johannesburg, foundry suppliers and engineers (representative, B. P. Skok); Marks Engineering Works, 118, Buitengracht Street, Reibech Square, Cape Town, engineers (representative, C. S. Marks).

As Members

A. Aust, foundry foreman, Royal Ordnance Factory; J. Burrell, foundry manager, Marshall, Sons & Company, Limited, Gainsborough; R. M. Coggon, foundry equipment engineer, Harry F. Coggon & Company, Halifax; W. Galbraith, fettling shop foreman, Daimler Company, Limited, Coventry; G. M. W. Gillespie, foundry foreman, James & Company (Birmingham), Limited; R. Greenberg, analytical chemist and metallurgist, Metalac Laboratory, Johannesburg; D. C. Hagen, assistant chief draughtsman, G. & J. Weir, Limited, Glasgow; C. Holman, chief inspector, Magnal Products, Limited, Bristol; J. C. Leith, foundry manager, Smith & Wellstood, Limited, Bonnybridge; H. Rouse, steel foundry director, Wm. Jessop & Sons, Limited, Sheffield; R. I. Taylor, metallurgist, Suffolk Iron Foundry (1920), Limited, Stowmarket; T. C. Tsung, apprentice student, Hadfields, Limited, Sheffield; A. Turley, foundry superintendent, Richards (Leicester), Limited; R. Walter, director, Pennine Chainbelt Company, Limited, Leeds; C. Whitehouse, foundry foreman, F. H. Lloyd & Company, Limited, Wednesbury; A. E. Williams, assistant manager, Royal Ordnance Factory, Glasgow; G. H. Taylor, technical manager, Marco Conveyor & Engineering Company, London, E.11.

As Associate Members

E. A. Allen, foundry metallurgist, Marshall, Sons & Company, Limited, Gainsborough; C. Barstow, laboratory assistant, R. W. Crabtree & Sons, Limited, Leeds; W. Braithwaite, coreshop foreman, Worthington-Simpson, Limited, Newark; R. G. Britton, moulder, Aero Engines, Limited, Bristol; A. Brookes, foreman moulder, Firth-Vickers Stainless Steels, Limited, Sheffield; W. T. Cosby, industrial scientist, R. W. Crabtree & Sons, Limited, Leeds; L. Crook, fitter, Marine Work Gearings, Cape Province; H. M. Crosbie, moulder, South African Railways, East London, S.A.; R. Dalton, time and motion department, Qualcast, Limited, Derby; A. W. Donaldson, metallurgist, Fullwood Foundry Company, Limited, Hamilton; G. H. Elliott, foundry inspector, Stanton Ironworks Company, Limited, near Nottingham; D. A. I. Ellis, foreman moulder, Marshall, Sons & Company, Limited, Gainsborough; W. Glasby, moulder, John Smith & Company (Derby), Limited; H. Hart, steel moulder, Atlas Steel Foundry & Engineering Company, Limited, Glasgow; L. F. Hattersley, patternshop foreman, Gaskell & Chambers, Limited, Birmingham; R. H. Hopkins, foreman patternmaker, Qualcast, Limited, Derby; T. J. Hughes, chargehand, Wm. Gardner & Sons (Gloucester), Limited; B. W. Janson, chargehand moulder, Malleable Foundries, Benoni, South Africa; R. Jolly, research metallurgist, British Cast Iron Research Association; B. Jordan, loam moulder, Dorman, Long & Company, Limited, Middlesbrough; T. H. Lamb, steel moulder, Head, Wrightson & Company, Limited, Stockton-on-Tees; E. Langton, chemist-foundryman, Staveley Coal & Iron Company, Limited, Chesterfield; R. Louden, steel moulder, Atlas Steel Foundry & Engineering Company, Limited, Glasgow; J. R. McAdam, iron moulder, Eagle Brass & Iron Foundry, Boksburg, South Africa; K. C. Osborn, maintenance engineer, Thomas Richards & Sons, Limited, Bristol; P. R. Parker, assistant inspection officer, Government of India War Department; G. H. Pollard, foundry planning clerk, Hepworth & Grandage, Limited, Bradford; H. Rhodes, foreman fettler, Wm. Jessop & Sons, Limited, Sheffield; R. D. B. Robinson, assistant works manager, Stourbridge Engineers & Ironfounders, Limited; E. A. Rominski, technical engineer, Adirondack Foundries & Steel, Inc., U.S.A.; E. Smith, assistant manager, Jackson Bros. (Milton), Limited, Stoke-on-Trent; A. N. Swami, foreman, Indian Iron & Steel Company, Limited, Madras; W. Thomson, foreman moulder, Bathgate Foundry Company, Limited, Bathgate; R. L. Vally, moulder, James Barwell, Limited, Johannesburg; A. E. Warn, foreman patternmaker, H. J. Maybrey & Company, Limited, London, S.E.26; W. J. Williams, research metallurgist, British Cast Iron Research Association.

As Associates

J. M. Fernie, machine moulder, African Malleable Foundries, Limited, Benoni, South Africa; G. Foster, metallurgical apprentice, J. Blakeborough & Sons, Limited, Brighouse; J. Hood, patternmaker, Ashmore, Benson, Pease & Company, Limited, Stockton-on-Tees; R. Lindsay, metallurgist, J. Blakeborough & Sons, Limited, Brighouse; G. A. Mollentze, bricklayer (furnace), African Malleable Foundries, Limited, Benoni, South Africa; L. I. Van Oordt, laboratory assistant, Globe Engineering Works, Cape Province, South Africa.

As Associates (Student)

C. Astling, laboratory assistant, Worthington-Simpson, Limited, Newark; R. J. Fearn, assistant metallurgical chemist, Bamfords, Limited, Uttoxeter; J. Horsburgh, apprentice moulder, Bathgate Foundries, Limited, Bathgate; S. R. Locker, foundry clerk, Qualcast, Limited, Derby; R. B. Walter, apprentice, Howarth & Walter, Limited, Leeds.

SECOND LIST

As Subscribing Firm Members

Ince Waggon & Iron Works Company, Limited, Lower Ince, Wigan (representative, T. Danson).

Institute Elects New Members

AS MEMBERS

A. A. Ferguson, foundry manager, Moffats, Limited, Blackburn; R. G. Hanson, managing director, W. J. Molineux (Foundry Equipment), Limited, Wolverhampton; J. R. Hayward (transferred), foundry foreman, B.O.C. Engines, Bristol; J. Hill (transferred), foundry engineer, J. Gardom & Company, Ripley; O. R. J. Lee, metallurgist, British Non-Ferrous Metals Research Association; M. A. Parlanti, foundry manager, Glacier Metal Company, Limited, Alperton, Wembley; I. W. Wiles, foundry director, Wiles Manufacturing Company, Adelaide, South Australia; H. J. Willis, works manager, Magnal Products, Limited, Bristol.

AS ASSOCIATE MEMBERS

R. J. Chatburn, under-foreman, Howard & Bullough, Limited, Accrington; R. L. Clemmey, plate moulder, Taylor & Wilson, Limited, Accrington; W. Edwards, moulder, Lancashire Steel Corporation, Limited, Irlam; S. V. Green, foundry foreman, Rolls-Royce, Limited, Derby; L. C. Johnson, junior metallurgist, Stanton Ironworks Company, Limited, near Nottingham; J. Lomax, journeyman moulder, Howard & Bullough, Limited, Accrington; F. W. Nield, chemist and metallurgist, H. Wallwork & Company, Limited, Manchester; S. H. Offer, foundry manager and die designer, Chemical Warfare Defence, Porton; C. C. Ottaway, shop foreman, Mather & Smith, Limited, Ashford, Kent; J. R. Stokes, foreman patternmaker, Bristol Aeroplane Company, Limited; W. Tickle, foreman patternmaker, Ferranti, Limited, Hollingwood; W. W. Tunnicliffe, assistant foundry foreman, Bamfords, Limited, Uttoxeter; A. M. Whipp, pattern inspector, Lake & Elliot, Limited, Braintree; R. Whittaker, junior foundry foreman, Howard & Bullough, Limited, Accrington; H. J. Woodman, foundry foreman, Magnal Products, Limited, Bristol.

BONDING ACTION OF CLAYS

An investigation into the bonding action of clays, conducted by the Engineering Experiment Station, University of Illinois, and the State Geological Survey Department of Registration and Education, in co-operation with the Illinois Clay Products Company, Joliet, Illinois, has resulted in a Report (Bulletin Series No. 357), entitled "Part I—Clays in Green Moulding Sand," by Ralph E. Grim and F. Leicester Cuthbert, published by the University of Illinois. Among other aspects of the subject it deals with the concept of the structure of clays; classification of bonding clays; green compression strength in relation to tempering water; bulk density in relation to tempering water; green compression strength in relation to the amount and kind of clay in moulding mixtures; character of the clay coating of sand grains and distribution of tempering water in green sands; concept of the bonding action of clays in green sand; and of bulk density variations in moulding sands.

PUBLICATIONS RECEIVED

Brockhouse—A Study in Industrial Evolution. By Compton Mackenzie. Published by J. Brockhouse & Company, Limited, Victoria Works, Hill Top, West Bromwich.

The reviewer cannot call to mind any prior case where an industrial concern has called in a journalist of the calibre of Compton Mackenzie to record its history. In this age, when the daily cry is for more facts and figures, it is a pleasing relief to turn to a publication which tempers technology and statistics with history, human aspirations and accomplishments. This is the mixture which, illustrated by 24 excellent coloured plates reproduced from photographs taken by Dr. R. M. P. Conrad, serves to tell the story of the Brockhouse organisation. It is a very good mixture, yet it is weakest where we expected most strength. Though many references are made to the founder of the firm, John Brockhouse, the author has failed to re-create his personality in such a way as to leave on the mind of the reader any lasting impression. Again, when introducing Air Commodore J. G. Hearson, the manager of the Southport works, the biography he gives savours too strongly of an excerpt from "Who's Who." On the other hand, the author has succeeded in presenting an excellent word picture of the actual shops and the business they undertake. Who could forget that Brockhouse manufactures springs, anvils, chains, and buffers after his apt allusions. And, after all, that is the main object sought by the publishers.

V. C. F.

Malleable Iron Facts, No. 19. Issued by the Malleable Founders' Society, Union Commerce Building, Cleveland, Ohio, U.S.A.

This pamphlet carried four pictures designed to show the versatility of malleable iron. The first illustrates a case where a malleable casting has replaced a welded assembly, which was made up of one casting, one forging, three pieces of round bar stock and one flat. The second is a case where serious weight reduction was effected; the third deals with a case where the hook of a harness snap was cast at right angles to its final position to avoid the use of a core. Later it was bent cold to the required setting. Finally a tap is illustrated because it produced 160,000 malleable-iron rings at a speed of 120 ft. per min. This publication is only a four-page leaflet, but it has excellent and convincing propaganda value.

DRAWING OFFICE EQUIPMENT

The British Standards Institution has issued a publication containing the first four of a series of specifications relating to drawing office boards and tee squares (B.S. Nos. 1265 to 1268). Copies (including the four Specifications) can be obtained from the British Standards Institution, Publications Department, 28, Victoria Street, London, S.W.1 (price 2s. post free).

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NEWS IN BRIEF

JOHN FOWLER & COMPANY (LEEDS), LIMITED, have taken over a Ministry of Supply foundry at Sprotborough, near Doncaster, for the manufacture of links for tractors.

AS FROM DECEMBER 31 the address of the London office of the Brightside Foundry & Engineering Company, Limited, will be Craven House, Northumberland Avenue, W.C.2.

THE MASSEY-HARRIS COMPANY, of Canada, is taking over a Government factory at Trafford Park, Manchester, where it will make agricultural machinery for the British market and for export.

THE BETHLEHEM STEEL CORPORATION has begun work on a £5,000,000 programme for the modernisation of two of its bar-producing plants. Output of high-quality steel bars is to be increased.

A PAPER ON "Non-ferrous Welding" will be given by Mr. F. Clark at a meeting of the East Scotland branch of the Institute of Welding at the Heriot Watt College, Chambers Street, Edinburgh, at 7.30 p.m., on December 28.

THE MINISTER OF LABOUR AND NATIONAL SERVICE intends to make under the Factories Act, 1937, the Magnesium (Grinding of Castings and Other Articles) Special Regulations, 1946. A draft of the regulations has been published by the Stationery Office, from which copies can be obtained (price 1d.).

THE REGIONAL ORGANISATIONS of the Ministries of Supply and Aircraft Production are to be merged under one Regional Controller in each region. Arrangements for the merger should be complete by the end of the year. Announcements of appointments of Regional Controllers will be made shortly.

ABOUT 100,000 SQ. FT. of redundant space at the Scotswood Works, Newcastle-upon-Tyne, of Vickers-Armstrongs, Limited, has been allocated to Charles Churchill & Company, Limited, engineers and machine-tool makers. The company will employ several hundred workers, and it is hoped that other firms will take over further space.

MR. HERBERT MORRISON, Lord President of the Council, has decided to appoint a committee of leading scientists and others to consider the policies which would govern the use and development of Britain's scientific man-power and resources in the next 10 years. He has asked the committee to submit an interim report on broad lines at an early date.

THE STEEL COMPANY OF SCOTLAND, LIMITED, have intimated to employees at their Hallside Works, Lanarkshire, that the small bar mill there will be closed at an early date and extensions carried through at other mills operated by the company in the area. The change will not affect the volume of output, but will reduce the number of employees engaged, some 200 having been meantime warned of impending dismissal. A protest has been advanced by the worker's representatives to Mr. Gilbert M'Allister, M.P. for Rutherglen.

STIRLING EDUCATION COMMITTEE has appointed three representatives and the Director of Education to meet representatives of the National Light Castings Ironfounders' Federation to consider the Federation's suggestions for co-operation in interesting schoolboys in ironfounding along lines similar to those at present existing in the Falkirk Trades School in relation to the training of boys for the building industry, and also to consider the inclusion of ironfounding in the lay school curriculum.

IT IS OFFICIALLY ANNOUNCED that an industry entirely new to Tees-side is to be established at Stockton. Through the medium of the Tees-side Industrial Development Board, the Le Tourneau Company, of Peoria, Illinois, and Stackton, California, U.S.A., have secured an extensive site and propose to occupy a factory covering an area of 150,000 sq. ft. for the production of mechanical earth-mining equipment. The factory will be built by the North Eastern Trading Estates, Limited, on behalf of the Board of Trade and will be leased to the company, whose British interests will be in charge of Brigadier Blood, formerly an officer attached to the British Purchasing Commission in Washington.

OBITUARY

MR. ROLAND B. KEATES, a director of the Willenhall Pressure Die Casting Company, Limited, Wolverhampton, died recently, aged 61.

MR. SAMUEL LUND, formerly principal of the firm of Samuel Lund & Sons, ironfounders, Keighley, has died at Morecambe, aged 78.

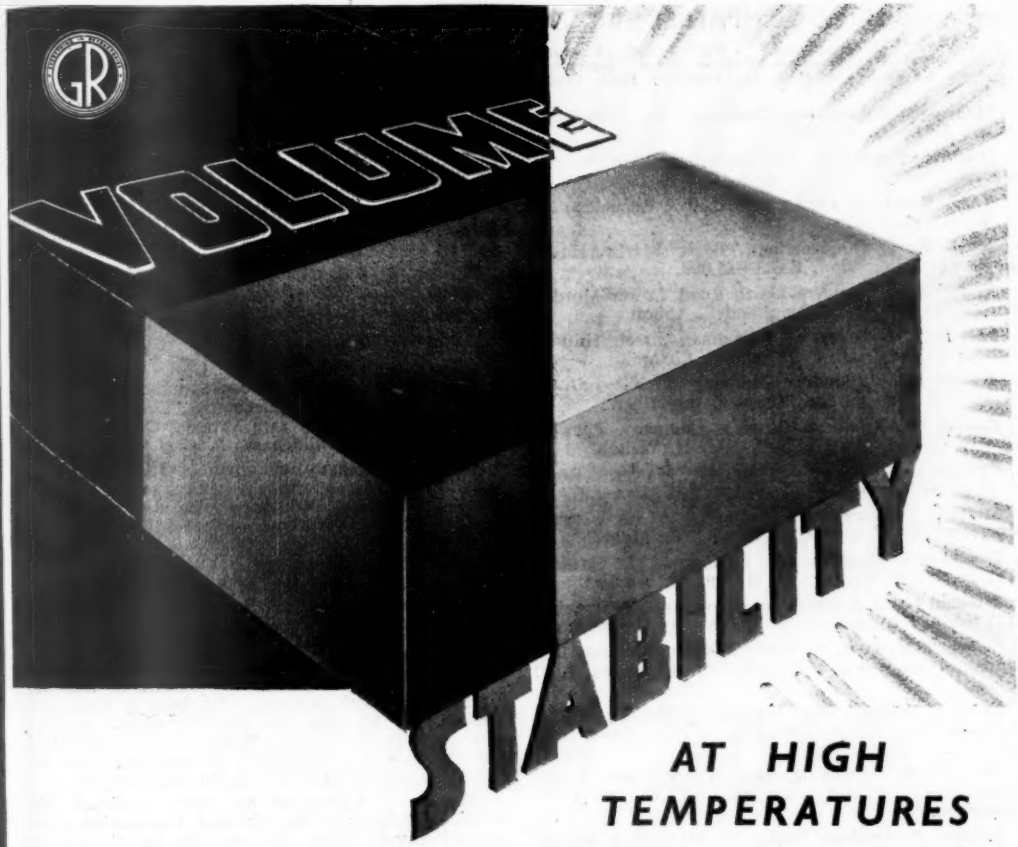
MR. JAMES HENRY BROWN, district manager for Peter Brotherhood, Limited, died on December 6 at Old Trafford, Manchester. He was 74.

DR. JAMES WATT, who died recently in an Edinburgh nursing home, at the age of 82, was a director of the Anderston Foundry Company, Limited, Edinburgh.

MR. WILLIAM BOYD, formerly chief of the steel department of Lithgows, Limited, shipbuilders, Port Glasgow, died recently at Longbank, Renfrewshire. He was employed by the firm as a draughtsman before being promoted to the steel department.

NEW I.C.I. PROJECT

Imperial Chemical Industries, Limited, as part of its post-war development programme, has bought over 3,500 acres of the Wilton estate in North-East Yorkshire, 3 miles from Middlesbrough. This will be developed over the next five years or so for the large-scale production of heavy organic chemicals, whether from oil or coal. The full fruition of the project is expected to give employment to over 10,000 persons. Capital expenditure is estimated at upwards of £10,000,000.



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THE *abnormal* expansion or contraction of refractory products endangers both the furnace structures and the process. It is one of the many aspects of refractories' manufacture which is subject to normal routine control in all G.R. works, where the maximum permissible firing temperatures are applied to ensure that all G.R. refractory products are volume stable in use. G.R. engineers are available on request to advise users on the selection and application of refractory products.

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NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Manwood Engineering Company, 64, Manchester Street, Heywood—£1,000.

Warners (Engineers), Ten Acre Lane, Thorpe, near Chertsey, Surrey—£1,000.

A. G. Burton & Company—£2,000. Engineers, etc. J. Wells, Coatbridge, subscriber.

Reed Bros. (Engineering), Bevis Marks House, Bevis Marks, London, E.C.3—£5,000.

Non-Ferrous Founders, Garth Road, Lower Morden, Surrey—£4,000. J. McQuire and L. Abbott.

Hill Bros. Foundry, 68, Goodman Street, Hunslet, Leeds—£30,000. H., C. R., and E. Loxton.

Kingsworthy Foundry Company—£1,300. J. E. Wren, 153, The Parade, Watford, subscriber.

Phœnix Crankshaft & Bearings Company, Penwith, Chorley Wood, Herts—£2,000. G. H. Walton.

Peerless Engineering Company, 438, Mansfield Road, Redhill, Notts—£1,000. A. E. and F. E. Evans.

Multiple Engineering Products, Africa House, Kingsway, London, W.C.2—£1,000. B. Moore.

Goodwood Amalgamated Engineers, 13, Hastings Avenue, Ilford—£1,000. L. M. and M. Brooks.

Midland Grate & Hardware Company, 52, Gravelley Hill North, Birmingham, 23—£1,000. S. Thorneywork.

Homan & Rodgers, 10, Marsden Street, Manchester—Structural engineers. £10,000. J. Ross and T. J. Tonge.

Goode's Engineering Company, Heath Works, Baldock Road, Royston—£5,000. J. R. Cox and T. R. Braybon.

W. Boydell & Sons (Leigh), Brown Street, Leigh, Lancs—Engineers, etc. £10,000. J. W. and J. B. Ainsworth.

London Productions Tools, 59, Burnt Oak Broadway, Edgware, Mdx.—£1,000. H. Shortt and E. Nightingale.

G. Johnson Bros., 103/149, Cornwall Road, London, N.15—Metal workers, etc. £30,000. G. and C. Johnson.

W. Marcus Scott & Company, 37/39, King Street, Twickenham, Mdx—Engineers, etc. £3,000. W. M. and I. Scott.

Metchley Metals, 5a, Old Church Road, Harborne, Birmingham—Metal workers. £500. K. E. Price and G. B. Walter.

Kera Engineers, Stafford House, 14/20, King William Street, London, E.C.4—£1,000. P. D. Clark and F. V. Ball.

Binnie Bros. (Engineering), 7, Anderson Street, Port Glasgow—Engineers and ironfounders. £1,000. A. M. and M. S. Binnie.

Grubb & Whiteside, Sylvester Street Works, Lancaster—Engineers, etc. £2,000. J. Whiteside, T. N., L. N., and R. Grubb.

Solway Engineering Company—£10,000. J. T. Brooks, A. J. Milton, and E. E. V. Rowley, 7, St. Martins East, Leicester.

E. J. Nicholls, 21, Stafford Street, Wolverhampton—Electrical and mechanical engineers, etc. £4,000. E. J. and H. A. Nicholls.

Aluminium Construction, Donington House, Norfolk Street, London, W.C.2—£1,000. W. Hamilton and H. M. Garland Wells.

Weaver & Caswell, 30, Upbrook Mews, Craven Road, London, W.2—Engineers, etc. £1,000. I. M. Weaver and R. S. Caswell.

PERSONAL

DR. H. M. GLASS has been appointed director of research with General Refractories, Limited, of Sheffield. He was formerly with Imperial Chemical Industries, Limited, at Billingham.

MR. C. W. PARKES, chairman of Josiah Parkes & Sons, Limited, non-ferrous founders, etc., of Union Works, Willenhall, has been elected vice-chairman of the Board of Governors of the Royal Hospital, Wolverhampton.

MR. T. W. EDWARDS, J.P., commercial manager and secretary for some years of the Park Gate Iron & Steel Company, Limited, Rotherham, has been appointed assistant managing director. MR. HARRY WILLIAMS, works manager, has been appointed director and general manager.

MR. A. F. C. GARDNER, of Rotherham, technical representative with Newton, Chambers & Company, Limited, for 13 years, has been appointed northern area manager for Gibbons Bros., Limited, of Dudley. Mr. Gardner has received a presentation from his colleagues with Newton, Chambers & Company.

MR. W. G. CRAWFORD has been appointed chief electrical designer to the Harland Engineering Company, Limited, Alloa. He will take up his appointment on January 1. Mr. Crawford spent some years in the early days of his career with the Harland Company, and now returns to take the place of Mr. L. Greenwood, who is relinquishing his post.

CONTRACTS OPEN

Any date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Dublin, January 9—135 tons of British Standard tramway rails, with necessary fishplates and bolts, for the Port and Docks Board. Engineer's Office, Dublin Port and Docks Board, East Wall, Dublin.

Pocklington—Supply and laying of 1,900 yds. of 6-in., 4-in. and 3-in. spun-iron mains, etc., for the Rural District Council. Mr. J. H. Haistie, 4, Queen Square, Woodhouse Lane, Leeds, 2. (Fee £2 2s., returnable.)

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Raw Material Markets

IRON AND STEEL

A fairly steady trade in foundry pig-iron has been passing during the last week. The tonnages covered by licences are not being increased substantially, though the tendency is towards a slight expansion in the aggregate quantity delivered. Makers of textile machinery are demanding a little more pig-iron, though labour difficulties still stand in the way of any marked improvement. There is a steady demand from heavy electrical machinery firms and also from machine-tool makers, although the engineering foundries generally have not yet got fully into their stride following the cancellation of war contracts. Light-castings firms have plenty of work at their disposal and are increasing outputs to some extent in spite of the shortage of moulders and other skilled workers.

Scrap, although not plentiful, is arriving in sufficient tonnages to meet present demand. Reasonable quantities of coke are available and other requirements of the foundries, such as ganister, firebricks, limestone, etc., are coming forward quite well. Ferro-alloys for foundry and steelworks' use are in good supply, and under the latest Control of Iron and Steel Order (No. 45), there has been a relaxation of the restrictions on their acquisition and use. Under the Order the following may now be acquired without licence:—Ferro-alloys (other than spiegeleisen and ferro-manganese smelted in a blast furnace); calcium silicide; tungsten metal powder; tungsten metal sintered lumps; tungsten metal scrap; titanium carbide; cemented carbide hard metal; molybdenum metal powder; molybdenum metal scrap; any chemical compound of molybdenum or tungsten or vanadium.

Makers of semi-finished steel are receiving a steady flow of delivery specifications from re-rollers, who are anxious to acquire all the steel they can get. The semis position is still tight in spite of the receipt of tonnages purchased in the Dominions by the Control. Heavy joists and sections continue to meet with a moderate demand, while light bars and sections are in great request. A brisk demand is maintained for plates and there is no falling off in the call for sheets, most of the mills being booked up for a long period ahead.

NON-FERROUS METALS

There continues to be a fair demand for the non-ferrous metals and the tonnage would be larger still if the manufacturers of the various products so much in demand at home and abroad could get all the labour they want. The supply position is reasonably satisfactory at the moment, for probably only in the case of tin is it impossible to satisfy all requirements. The lead position is fairly tight, for the world output has not so far been able to catch up with the spurt in the demand. Meanwhile, reserves are being drawn upon. Output should slowly improve, but it may take some time to rebuild stocks, and while this is being done it may be expected that the demand will continue to increase. Users of copper and zinc appear to be experiencing no difficulty in securing the tonnages they require.

NOTES FROM THE BRANCHES

BIRMINGHAM, COVENTRY AND WEST MIDLANDS BRANCH.—Three short Papers dealing with economical and quick methods of preparing plate patterns for limited quantity production were read at the November meeting. Mr. A. J. Shore (branch president) presented the diploma of the Institute to Mr. Adam Dunlop for his Paper on "Precision Castings by the Lost Wax Process." Members were reminded that the annual dinner and dance of the branch would be held at the Edgbaston Botanical Gardens, Birmingham, on January 25, 1946, tickets 15s. each. The first Paper to be presented was that on "Pattern Blocks for Small-scale Production," by Mr. S. Yates. This was followed by a Paper on "A Method of Pattern Production Using a Plaster Compound," by Mr. A. H. Squires, and "Production of Pattern Plates on a Transfer System by Means of a Pattern Duplicator," by Mr. H. J. Roe. These will be printed in future issues of the Journal.

MEASURING WALL THICKNESS

By measuring the amount of back-scattered gamma rays, it is now possible to determine the thickness of walls of piping or vessels, which hitherto has meant the drilling of a hole into the structure and the use of mechanical calipers. A tiny amount of radium salt enclosed in a needle is the source of gamma rays utilised in the "Penetron," a development of the Texaco Development Corporation, New York. Readings, states a recent issue of the "Iron Age," can be made with the "Penetron" in 25 sec. without requiring shut-down of the equipment. By measuring the intensity of back-scattered radiations which increases as a direct function of the thickness of the material, the device can be used on various materials, including steel, aluminium, plastic, brass and wood. The weight of the equipment is about 40 lbs.

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